Request for Economic Stimulus Funds

Concept Proposal

Submitters

Workgroup Name: Google Earth and Google Maps for Environmental Assessment Kentucky Working Group

Dr. Tom Mueller (Workgroup Chair and PI) - Associate Professor at the University of Kentucky; Soil and Water Conservation and Management, Geospatial Analysis

Dr. Haluk Cetin (co-PI) Associate Professor at Murray State; Remote Sensing

Dr. Jessica McCarty (co-PI) University of Louisville; expert in fire, land use change, and agriculture mapping using remote sensing datasets

Dr. Christi McMichael (co-PI) Associate Professor at Morehead State University, Remote Sensing and Hydrological Modeling

Project Title: Disseminating NASA data with Google Maps and Google Earth

Project Partners

Academic Institutions	Department of Plant and Soil Sciences and the Tracy Farmer Institute for the Environment, U. of KY
	Mid America Center for Remote Sensing at Murray State U.
	Department of Geography and Geosciences, U. of Louisville
	Kentucky View at Morehead State U
Private Industry	T.J. Technologies, Cedar Lake, IN.
Government Agencies	Kentucky Division of Geographic Information
	Kentucky Geological Survey

Project Background & Purpose

Statement of Problem: NASA datasets are underutilized because people do not have easy access to these data and they are not combined with other relevant information from other government agencies. This has had long-term negative economic and environmental consequences.

Examples of how NASA data could be better be utilized: Extensive NASA datasets exist that can help citizens and government make better decisions. Terrain attributes derived from NASA LIDAR data could be used to help identify where erosion control measures (e.g., grassed waterways) should be placed in crop and forested lands. Remote sensing can identify where algae blooms are occurring. Vegetative stress indices can help land managers identify limitations to plant productivity (e.g., water or nutrient deficiencies, soil limitations). Satellite imagery can help determine the locations of sewer overflows so that municipalities can better comply with the EPA Clean Water Act. Impervious land use cover maps assist those making land land-use planning decisions.

What has been done to date. We have already developed procedures to visualize environmental data in Google Earth (Figure 1; Hamilton et al., 2009) and Google Maps API (Figure 2; Mueller et al., 2008). Our Google Earth dataset allows visitors to view vector and raster data efficiently through the use of image tiling and the use of regions. Additionally, soils data can be queried and the legend data is visible in the browser window at the bottom of the Google Earth window (Figure 1). The Google Maps API web page mash-up allows web site visitors to easily turn on and off data layers so that web site visitors can select which data layers to view (Figure 2).

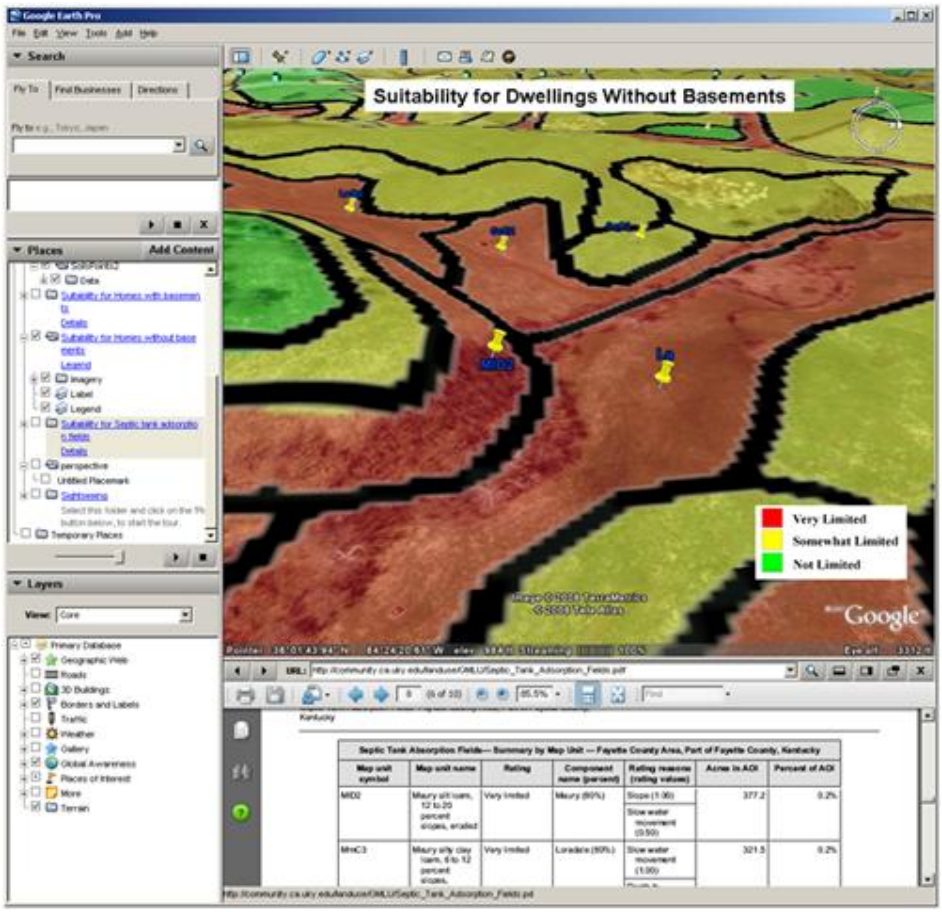

Figure 1. Example of the Google Earth database (From Hamilton et al., 2009). The dataset used to create this map can be found line at http://sites.google.com/site/joegepaper/.

Objective: The objectives of this project are to **1)** improve and automate methodologies for building Google Earth and Google Maps data mash-ups that would provide citizens easy access to NASA and other geospatial datasets; **2)** develop pilot Google Earth and Google Maps datasets for the Lexington, Louisville, Morehead, Murray, and Paducah, KY metro areas including some datasets for the entire commonwealth of Kentucky, **3)** develop mirrored servers in Lexington and Louisville so that data can be efficiently disseminated across the state, **4)** and educate K-12 instructors, university students, and citizens to use these datasets for decision making.

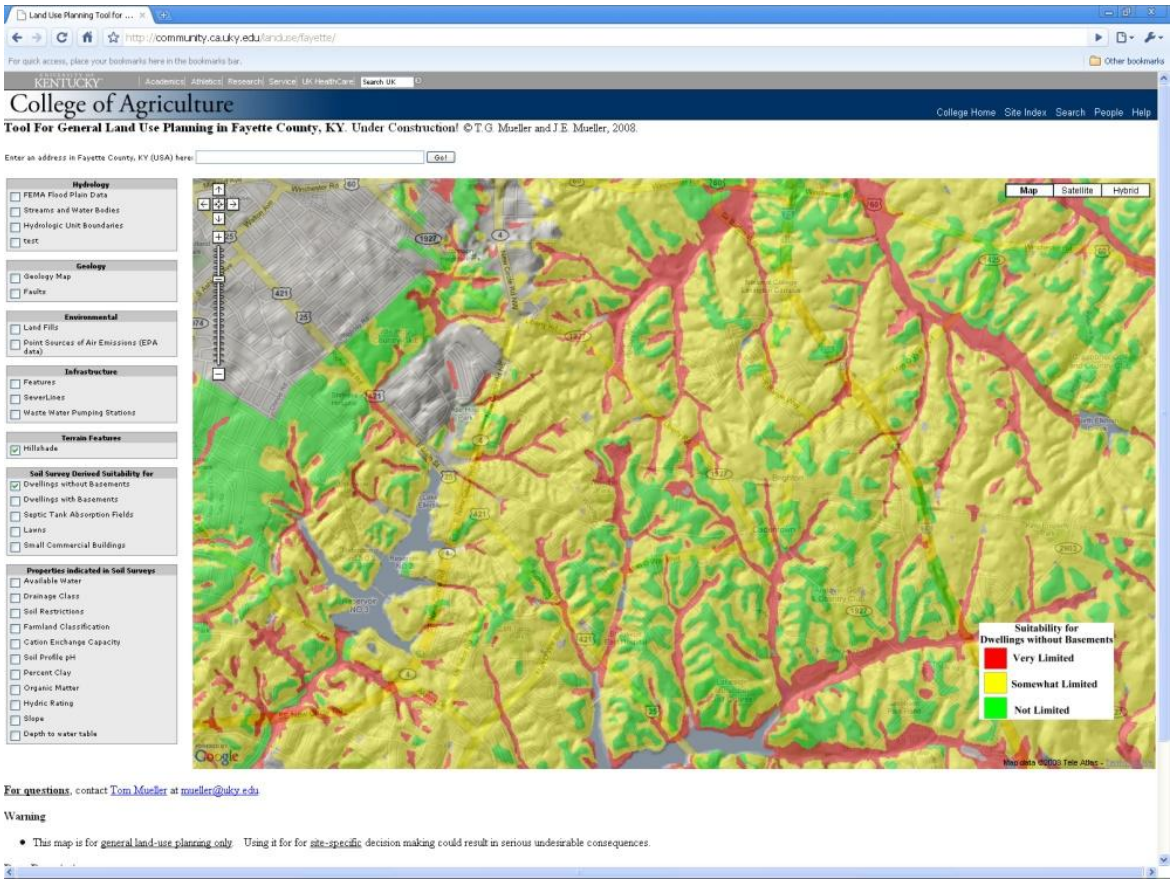

Figure 2. Example of web page created using Google Maps API (Based on the work published in Mueller et al., 2008). This map can be accessed with Mozilla Firefox, Google Chrome, and Safari at http://community.ca.uky.edu/landuse/fayette/. It has not yet been configured for Internet Explorer.

Project Description

Google Earth and Google Maps Software Design: Software will be written to 1) to automate the preparation of data in ArcGIS to that it can be rapidly exported for additionally processing, 2) to tile (pyramid) image datasets so they can be viewed in Google formats, and 3) add vector data to Google Earth such that the user will be able to query the data sets so that the requested information will appear in the web browser within Google Earth, and 4) create the Google Maps API web pages dynamically.

Datasets that will be put in a Google Earth and Google Maps format: Numerous NASA data products will be added to the Google Maps and Google Earth datasets. Specifically, MODIS 16-day NDVI composites (MOD44C), Thermal Anomalies (MOD14/MYD14), Burned Area (MCD45A1), and Vegetation Continuous Fields (MOD44B) will be integrated into the system to allow users to access coarse-scale MODIS land science data sets and to produce land cover and land use change maps. Additional NASA assets to be included are Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO), which can be used to geographically demonstrate the relationships between aerosols and land use/land cover change, and Hyperion, a hyperspectral satellite onboard EO-1 which enables complex land use and land cover classifications and change detections. The USDA NASS Cropland Data Layer for Kentucky for the years 2008 and 2009 will also be combined to provide detailed mapping of agriculture in the state, including specific crop types. These datasets will be added by the University of Louisville, Murray, and Morehead State groups.

In addition to the NASA datasets, USDA soil survey data indicating soil properties and limitations for soil use and management (e.g., where homes with and without basements should be built, suitability for roads, etc.), terrain attribute data, FEMA 100 year flood data, EPA emission data, surficial geology and associated land use interpretations will be added by the University of Kentucky group.

Data Servers

Servers will be located at the University of Kentucky, University of Louisville, and Murray State University. Mirrored servers will reduce maintenance costs, learning curve, etc. The servers will be redundant so that data can be accessed by the Google software and task the server with the least amount of traffic.

Education and Outreach

Dr. Carol Hanley will assist with the development of educational modules for K-12 instructors. Dr. Brad Lee will lead extension outreach programs to Kentucky citizens. Dr. Tom Mueller, Dr. Haluk Cetin, and Dr. Jessica McCarty, Dr. Brian Lee, and Dr. Christie McMichael will train university students to use these datasets for resource management decisions.

Project Team

Project Manager – Tom Mueller (Associate Professor at U. of KY; Expertise in Soil and Water Conservation and Management, Geospatial Analysis)

Faculty Investigators

Dr. Haluk Cetin (Director, Hyperspectral Laboratory, Associate Professor at Murray State U., Expertise in Remote Sensing/GIS)

Dr. Jessica McCarty (Assistant Professor at U. of Louisville; Expertise in fire, land use change, and agriculture mapping using remote sensing datasets)

Dr. Christi McMichael (Associate Professor at Morehead State University, Expertise in Remote Sensing and Hydrological Modeling)

Dr. Brian Lee (Associate Professor at UK, Expertise in Land Use Planning and Geospatial analysis).

Dr. Brad Lee (Associate Professor, UK, Specialty- Water Quality)

Dr. Carol Hanley (Tracy Farmer Institute for the Environment, University of Kentucky; Specialist in K through 12 environmental education)

Government Collaborator

Dr. Demetrio Zourakis (Division of Geographic Information, Commonwealth

Dr. Dan Carry (Kentucky Geological Survey and Adjunct Professor, UK, Specialty – Geology and Land Use) – involvement is still tentative.

Google Maps and Google Earth Web Programmers

Mr. J.E. Mueller, T.J. Tech

Mr. J. Cardinal, ASI System Integration

Project Budget & Amount of Economic Stimulus Funds Requested:

The tentative budget total is 1.7 million for three years of this project. This includes subcontracts of $470,000, 120,000, 120,000, and 340,000 subcontracts to the University of Louisville, Murray State University, Morehead State University, and T.J. Tech. Inc. The total overhead will be $228,253 (indirect rate of 39% except on the subcontract amounts exceeding $25,000). The University of Kentucky Budget includes $440,000 for personal, $12,000 for equipment (server

and two workstations), $1,500 for supplies, 12,486 for travel, 6,000 for publication charges, 28,000 for graduate student tuition. The budgets for the four subcontractors will be described in detail in the full proposal.

References

N.J. Hamilton, B. Mijatovic, T.G. Mueller, B.D. Lee, B.W. Kew, H. Cetin. 2009. Google Earth Dissemination of Soil Survey Derived Interpretations for Land-Use Planning. Submitted to the Journal of Extension. (In Press)

Mueller, T.G., N. Hamilton, A.C. Pike, B.D. Lee, A.D. Karathanasis, T.J. Nieman, J.E. Mueller, D. Carey, and D. Zourarakis. 2008. Google Maps as an Aid for land-use planning decisions. In R. Khosla (ed.) Proc. 8th International Conference on Precision Agriculture and other Precision Resources Management. ASA Misc. Publ., ASA, CSSA, and SSSA, Madison, WI. Published on CD.